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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/595,564	04/27/2006	Jacobus Cornelis Haartsen	P17303-US1	2815

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EXAMINER	
HSIEH, PING Y	
ART UNIT	**PAPER NUMBER**
2618	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/595,564	HAARTSEN, JACOBUS CORNELIS	
	Examiner	Art Unit	
	PING Y. HSIEH	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 April 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/22/09 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kao (U.S. PG-PUB NO. 2004/0077377) in view of Mesecher et al. (U.S. PATENT NO. 6,937,879) and further in view of Walton et al. (U.S. PATENT NO. 7,248,879).

-Regarding claim 1, Kao discloses a method of interference cancellation in radio communication signals received by a radio access unit of a radio communication system, said radio access unit comprising receiver means and antenna means, said antenna means having a plurality of directionally separated antenna elements for adaptively receiving radio communication signals transmitted by a plurality of remote mobile radio communication units **(as**

disclosed in fig. 4 and paragraph 15), said method comprising the steps of: a) obtaining radio signals received by each of said antenna elements **(the AP 50 comprises a plurality of smart antenna 52 for receiving a plurality of radio frequency signals 80 as disclosed in fig. 4 and further disclosed in paragraph 21)**; b) determining first weighing factors for optimally selecting radio signals of a first mobile radio communication unit among said radio signals obtained in step a) **(the processor 56 calculates a plurality of weighing factors for the plurality of weighing modules 54 according to the phase θ as disclosed in step 112, fig. 5 and further disclosed in paragraph 29)**; c) weighing said radio signals obtained in step a) by said first weighing factors providing a first radio signal of said first radio communication unit **(use each of the weighing modules 54 to weigh base band signals transmitted from a smart antenna 52 corresponding to the weighing module at a second time with a weighing factor corresponding to the weighing module 54 as disclosed in step 114, fig. 5 and further disclosed in paragraph 30)**; d) determining second weighing factors for optimally selecting radio signals of a second mobile radio communication unit among said radio signals obtained in step a) **(the processor 56 calculates a plurality of weighing factors for the plurality of weighing modules 54 according to the phase θ as disclosed in step 112, fig. 5 and further disclosed in paragraph 29)**; e) weighing said radio signals obtained in step a) by said second weighing factors providing a second radio signal of said second radio communication unit **(use each of the weighing**

modules 54 to weigh base band signals transmitted from a smart antenna 52 corresponding to the weighing module at a second time with a weighing factor corresponding to the weighing module 54 as disclosed in step 114, fig. 5 and further disclosed in paragraph 30). Kao further discloses an adder 58 to sum up all the weighed base band signals transmitted from the weighing modules 54 as disclosed in step 116 and paragraph 31; and the processor 56 is allowed to execute the steps 108, 110 and 112 for every predetermined number of the periods as disclosed in paragraph 33. However, Kao fails to disclose the adder 58 to subtract from said second radio signal provided in step e) said first radio signal provided in step c) weighed by said second weighing factors, providing a corrected second radio signal.

Mesecher et al. disclose subtracting from said second radio signal said first radio signal, providing a corrected second radio signal **(weighting signal received by the narrow beam directional antenna 145 by a factor α and subtracting it from the signal received from the main antenna 143 using a summer 149 as disclosed in fig. 10 and further disclosed in col. 8 lines 27-34)**.

Therefore, it would have been obvious to one of ordinary skills in the art at the time of invention to modify the adder 58 as disclosed by Kao to be able to subtract signals as disclosed by Mesecher et al., and repeating the steps. One is motivated as such in order to radio signal quality. However, the combination of Kao and Mesecher et al. fails to disclose repeating steps for a further mobile

radio communication unit by determining further weighing factors, providing a further radio signal of said further radio communication unit and providing a corrected further radio signal by each time subtracting from said further radio signal said previously obtained corrected radio signals weighed by said further weighing factors by reconstructing the first and second radio signals and accumulating the reconstructed first and second radio signals which reduces interference to the further radio signal from the first and second radio signals, till a stop criterium has been satisfied.

Walton et al. disclose repeating steps for a further radio communication unit by determining further weighing factors, providing a further radio signal of said further radio communication unit and providing a corrected further radio signal by each time subtracting from said further radio signal said previously obtained corrected radio signals weighed by said further weighing factors by reconstructing the first **(reconstruct r^1 to r^2 as disclosed in fig. 7 and further disclosed in col. 23 line 56-col. 24 line 58)** and second radio signals **(reconstruct r^2 to r^3 as disclosed in fig. 7 and further disclosed in col. 23 line 56-col. 24 line 58)** and accumulating the reconstructed first and second radio signals which reduces interference to the further radio signal from the first and second radio signals **(r^n as disclosed in fig. 7 and further disclosed in col. 23 line 56-col. 24 line 58)**, till a stop criterium has been satisfied **(successive cancellation technique as disclosed in fig. 7 and further disclosed in col. 23 line 56-col. 24 line 58)**.

Therefore, it would have been obvious to one of ordinary skills in the art at the time of invention to modify the AP 50 as disclosed by Kao to implement the successive cancellation technique as disclosed by Walton et al. One is motivated as such in order to provide a more accurate way of reducing interference.

-Regarding claims 2 and 12, the combination further discloses said weighing factors are obtained by forming conceptual antenna patterns with said plurality of directionally separated antenna elements **(Mesecher et al., the RF adaptive canceller 41 provides weights to each of the interference signals received by the coplanar feeds 49_1-49_n as disclosed in col. 4 lines 18-31)**.

-Regarding claims 3 and 13, the combination further discloses said weighing factors are selected for optimally selecting radio signals of a respective radio communication unit and for optimally suppressing radio signals corresponding to any other radio communication unit **(the weighted interference replicas are summed to provide a combined interference signal, which is subtracted from the signal from the main antenna 37 thereby deriving a signal substantially free from the interference source 47 as disclosed in col. 4 lines 18-31)**.

-Regarding claims 4 and 14, the combination further discloses said radio signals obtained in step a) are ordered from strongest to weakest according to receive signal strength, and wherein said first, second and further radio communication units are selected in descending order of receive signal strength **(Although the combination does not specifically disclose the signals are**

ordered from strongest to weakest according to receive signal strength, Examiner takes official notice that ordering means for radio signals was well known in the art and would have been obvious to one of ordinary skill in the art at the time of the invention to organize signals. This modification would have been prompted because it would require some ordering means for organizing baseband signals in further stage).

-Regarding claims 5 and 15, the combination further discloses said first, second and further corrected radio signals are demodulated into first, second and further demodulated signals, respectively, and stored in storage means, and wherein for providing said corrected radio signals said demodulated signals are reconstructed into corresponding radio signals **(Walton et al., as disclosed in fig. 7 and further disclosed in col. 23 line 56-col. 24 line 58)**.

-Regarding claims 6-8 and 16, the combination further discloses means arranged for stopping signal processing in accordance with a stopping criterium including any of stopping said signal processing **(Walton et al., as disclosed in fig. 7)**: once a corrected radio signal has been provided corresponding to a radio communication unit of interest, till said interference cancellation, between successive repetitions of providing a corrected respective radio signal, drops below a set value, or after a set time period lapsed **(although the combination does not specifically disclose all stopping criterium, the different criterium are design choice and do not have to be identical)**.

-Regarding claims 9, 10, 17 and 18, the combination further disclose analog to digital conversion means for digitizing said stored radio signals **(Mesecher et al., A/D converter 71, FIG. 5)**, wherein said processing means are digital signal processing means, and said demodulation means and reconstruction means are implemented in the digital domain by digital signal processing means **(Walton et al., digital signal processor as disclosed in col. 29 lines 44-51)**.

-Regarding claim 11, Kao discloses a signal processing device for interference cancellation in radio communication signals received by a radio access unit of a radio communication system **(as disclosed in fig. 4)**, said radio access unit comprising receiver means and antenna means said antenna means having a plurality of directionally separated antenna elements for adaptively receiving radio communication signals transmitted by a plurality of remote mobile radio communication units **(the AP 50 comprises a plurality of smart antenna 52 for receiving a plurality of radio frequency signals 80 as disclosed in fig. 4 and further disclosed in paragraph 21)**, said device comprising: means for storing radio signals received by each of said antenna elements **(Although Kao does not specifically disclose means for storing radio signals received by each of said antenna elements, Examiner takes official notice that storing means for radio signals was well known in the art and would have been obvious to one of ordinary skill in the art at the time of the invention to process signals. This modification would have been prompted because it**

would require some storing means for processing baseband signals in further stage); means for determining respective weighing factors for optimally selecting radio signals of a respective mobile radio communication unit among said stored radio signals **(the processor 56 calculates a plurality of weighing factors for the plurality of weighing modules 54 according to the phase θ as disclosed in step 112, fig. 5 and further disclosed in paragraph 29)**; and means for weighing said stored radio signals by said respective weighing factors for providing a respective radio signal of said respective radio communication unit **(use each of the weighing modules 54 to weigh base band signals transmitted from a smart antenna 52 corresponding to the weighing module at a second time with a weighing factor corresponding to the weighing module 54 as disclosed in step 114, fig. 5 and further disclosed in paragraph 30)**. Kao further discloses an adder 58 to sum up all the weighed base band signals transmitted from the weighing modules 54 as disclosed in step 116 and paragraph 31. However, Kao fails to disclose the adder 58 to subtract from said second radio signal provided in step e) said first radio signal provided in step c) weighed by said second weighing factors, providing a corrected second radio signal.

Mesecher et al. disclose subtracting from said second radio signal said first radio signal, providing a corrected second radio signal **(weighting signal received by the narrow beam directional antenna 145 by a factor α and subtracting it from the signal received from the main antenna 143 using a**

summer 149 as disclosed in fig. 10 and further disclosed in col. 8 lines 27-34).

Therefore, it would have been obvious to one of ordinary skills in the art at the time of invention to modify the adder 58 as disclosed by Kao to be able to subtract signals as disclosed by Mesecher et al., and repeating the steps. One is motivated as such in order to improve the radio signal quality. However, the combination of Kao and Mesecher et al. fails to disclose subtracting from said respective radio signal previously determined corrected radio signals of radio communication units weighed by said respective weighing factors by reconstructing radio signals of any other radio communication units and accumulating the reconstructed radio signals of any other radio communication units, for providing a corrected respective radio signal which reduces interference to the respective radio signal from the radio signals of any other radio communication units.

Walton et al. disclose subtracting from said respective radio signal previously determined corrected radio signals of radio communication units weighed by said respective weighing factors by reconstructing radio signals of any other radio communication units **(reconstruct r^2 to r^3 as disclosed in fig. 7 and further disclosed in col. 23 line 56-col. 24 line 58)** and accumulating the reconstructed radio signals of any other radio communication units, for providing a corrected respective radio signal which reduces interference to the respective

radio signal from the radio signals of any other radio communication units **(r^n as disclosed in fig. 7 and further disclosed in col. 23 line 56-col. 24 line 58)**.

Therefore, it would have been obvious to one of ordinary skills in the art at the time of invention to modify the AP 50 as disclosed by Kao to implement the successive cancellation technique as disclosed by Walton et al. One is motivated as such in order to provide a more accurate way of reducing interference.

Response to Arguments

4. Applicant's arguments filed 3/23/09 have been fully considered but they are not persuasive.

a. In pages 7-9 of the remarks, regarding claims 1 and 11, applicant argues that:

i. Kao does not teach a plurality of signal sources and the modification of the signals from that plurality by using the modified signals of each signal source to further modify the signals for the radio access unit.

The examiner respectfully disagrees. The examiner wants to point out that the applicant should consider the combination of the references as a whole. The combination indeed discloses a plurality of signal sources (Kao, plurality of signals 80 as disclosed in fig. 4 and paragraph 21); and the modification of the signals from that plurality by using the modified signals of each signal source to further modify the signals for the radio access unit (Kao, weighting signals as disclosed in fig. 5 and Mesecher,

subtracting weighting signal received by the narrow beam directional antenna 145 from the signal received from the main antenna 143 as disclosed in fig. 10 and col. 8 lines 27-36).

ii. Mesecher discloses receiving, by more than one antenna, first and second signals from a single source, which is opposite of the limitations in claims 1 and 11.

The examiner respectfully disagrees. Mesecher indeed discloses receiving by more than one antenna, first and second signals from different sources (signals received by main antenna 143 and signals received by narrow beam directional antenna 145 are from different sources as disclosed in col. 8 lines 21-36).

iii. The combination of Kao and Mesecher is not obvious because first, Kao teaches adding signals, and second, Mesecher, as in Kao does not disclose using the modified signals from each mobile communication unit to perform weighed signal from a first unit is subtracted from a weighed signal from a second unit.

The examiner respectfully disagrees. First, Kao discloses an adder 58 to sum all the weighed base band signals as disclosed in paragraph 31; and Mesecher discloses summer 149 to subtract weighed signal from interferences as disclosed in col. 8 lines 27-36. Therefore, it would have

been obvious to one of ordinary skills in the art at the time of invention to modify the adder 58 to be able to subtract signals as disclosed by Mesecher. One is motivated as such in order to reduce interference. Second, the combination indeed discloses using the modified signals from each mobile communication unit to perform weighed signal from a first unit is subtracted from a weighed signal from a second unit (Mesecher, subtracting weighting signal received by the narrow beam directional antenna 145 from the signal received from the main antenna 143 as disclosed in fig. 10 and col. 8 lines 27-3)6.

iv. Neither Kao nor Mesecher teach or suggest performing the iterative steps of the recited method for each received signal, one sginal at a time. Kao and Mesecher do not teach or suggest receiving a plurality of signals, and for each received signal, correcting the signal iteratively.

The examiner respectully disagrees. The combination indeed discloses receiving a plurality of signals, and for each received signal, correcting the signal iteratively (Kao, weighting signals as disclosed in fig. 5 and Mesecher, subtracting weighting signal received by the narrow beam directional antenna 145 from the signal received from the main antenna 143 as disclosed in fig. 10 and col. 8 lines 27-34).

v. Walton's signals being modified are signals received by a terminal from a MIMO antenna, which is opposite of the applicant's claims where a plurality of mobile communication units transmits to a multi-element antenna.

The examiner respectfully disagrees. Walton also discloses a plurality of mobile communication units transmits to a multi-element antenna as disclosed in fig. 1 and fig. 5.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PING Y. HSIEH whose telephone number is (571)270-3011. The examiner can normally be reached on Monday-Thursday (alternate Fridays) 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lana N. Le can be reached on (571)272-7891. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ping Y Hsieh/
Examiner, Art Unit 2618

/Lana N. Le/
Primary Examiner, Art Unit 2614